

1. Record Nr.	UNINA9910788450903321
Autore	Coffey William <1948->
Titolo	The Langevin equation [[electronic resource] ] : with applications to stochastic problems in physics, chemistry, and electrical engineering / W.T. Coffey, Yu. P. Kalmykov
Pubbl/distr/stampa	River Edge, NJ, : World Scientific, c2012
ISBN	981-4355-67-4
Edizione	[3rd ed.]
Descrizione fisica	1 online resource (852 p.)
Collana	World Scientific series in contemporary chemical physics ; ; v. 27
Altri autori (Persone)	KalmykovYu. P
Disciplina	519.2
Soggetti	Langevin equations Brownian motion processes
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Preface to the Tllird Edition; CONTENTS; Contents; Chapter 1 Historical Background and Introductory Concepts; 1.1. Brownian motion; 1.2. Einstein's explanation of Brownian movement; 1.3. The Langevin equation; 1.3.1. Calculation of Avogadro's number; 1.4. Einstein's Method; 1.5. Essential concepts in Statistical Mechanics; 1.5.1. Ensemble of systems; 1.5.2. Phase space; 1.5.3. Representative point; 1.5.4. Ergodic hypothesis; 1.5.5. Calculation of averages; 1.5.6. Liouville equation; 1.5.7. Reduction of the Liouville equation; 1.5.8. Langevin equation for a system with one degree of freedom 1.5.9. Intuitive derivation of the Klein-Kramers equation1.5.10. Conditions under which a Maxwellian distribution in the velocities may be deemed to be attained; 1.5.11. Very-high-damping (VHD) regime; 1.5.12. Very-low-damping (VLD) regime; 1.6. Probability theory; 1.6.1. Random variables and probability distributions; 1.6.2. The Gaussian distribution; 1.6.3. Moment-generating fimctious; 1.6.4. Central limit theorem; 1.6.5. Random processes; 1.6.6. Wiener-Khinchin theorem; 1.7. Application to the Langevin equation; 1.8. Wiener process; 1.8.1. Variance of the Wiener process 1.8.2. Wiener integrals1.9. The Fokker-Planok equation; 1.10. Drift and diffusion coefficients; 1.11. Solution of the one-dimensional Fokker-Planck equation; 1.12. The Smoluchowski equation; 1.13. Escape of particles over potential barriers: Kramers' theory; 1.13.1. Escape rate in

the IHD limit; 1.13.2. Kramers' calculation of the escape rate in the VLD limit; 1.13.3. Range of validity of the IHD and VLD formulas; 1.13.4. Extension of Kramers' theory to many dimensions in the IHD limit; 1.13.5. Langer's treatment of the IHD limit; 1.13.6. Kramers' formula as a special case of Langer's formula 1.13.7. Kramers' turn over problem 1.14. Applications of the theory of Brownian movement in a potential; 1.15. Rotational Brownian motion: application to dielectric relaxation; 1.15.1. Breakdown of the Debye theory at high frequencies; 1.16. Superparamagnetism: magnetic after-effect; 1.17. Brown's treatment of Neel relaxation; 1.18. Asymptotic expressions for the Neel relaxation time; 1.18.1. Magnetization reversal time in a uniaxial superparamagnet: application of Kramers' method; 1.18.2. Escape rate formulas for superparamagnets; 1.19. Ferrofluids 1.20. Depletion effect in a biased bistable potential 1.21. Stochastic resonance; 1.22. Anomalous diffusion; 1.22.1. Empirical formulas for the complex dielectric permittivity; 1.22.2. Theoretical justification for anomalous relaxation behavior; 1.22.3. Anomalous dielectric relaxation of an assembly of dipolar molecules; References; Chapter 2 Langevin Equations and Methods of Solution; 2.1. Criticisms of the Langevin equation; 2.2. Doob's interpretation of the Langevin equation; 2.3. Nonlinear Langevin equation with a multiplicative noise term: Ito and Stratonovich rules 2.4. Derivation of differential-recurrence relations from the one-dimensional Langevin equation

---

## Sommario/riassunto

This volume is the third edition of the first-ever elementary book on the Langevin equation method for the solution of problems involving the translational and rotational Brownian motion of particles and spins in a potential highlighting modern applications in physics, chemistry, electrical engineering, and so on. In order to improve the presentation, to accommodate all the new developments, and to appeal to the specialized interests of the various communities involved, the book has been extensively rewritten and a very large amount of new material has been added. This has been done in order t

---